

Total Quality Management in Engineering Education in India

Umesh M. Bhushi

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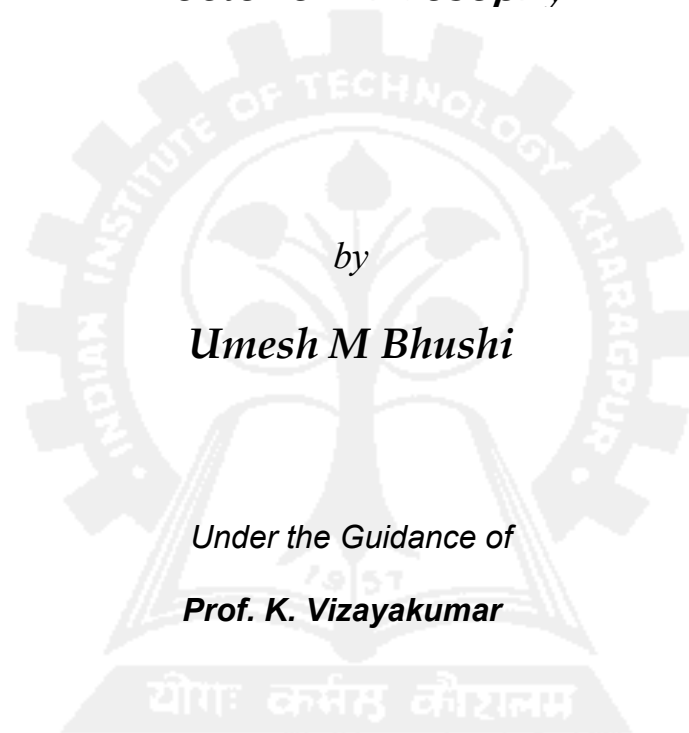
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Total Quality Management in Engineering Education in India

*thesis submitted to the
Indian Institute of Technology, Kharagpur
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Doctor of Philosophy



by

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Under the Guidance of

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May-2002**

Dedicated to

My Father

Late **Shri. Mahadevappa Bhushi**

Mentor, educationist and great human being

CERTIFICATE

This is to certify that, the thesis entitled "**Total Quality Management in Engineering Education in India**", which is being submitted to the Indian Institute of Technology, Kharagpur for the award of the degree of **Doctor of Philosophy** by **Mr.Umesh M. Bhushi**, is a record of bona-fide research work carried out by him, under my guidance. Mr.Bhushi has successfully completed the course requirements prescribed to him by the Doctoral Scrutiny Committee in accordance with the regulations of the Institute. In my opinion, the thesis has reached the standard of fulfilling the requirements and is worthy of award of the Degree. The results embodied in this thesis, have not been submitted elsewhere for the award of any other Degree or Diploma.

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UMESH BHUSHI

ABSTRACT

In this 21st century, workplace environment is changing rapidly, and technical competences as well as other potentials are constantly being redefined and the future of a technological society is shaped by the actions of engineers. Industries operating in this dynamic and fast changing environment have demonstrated readiness to change their practices and organizational structure as a response to technological changes. On the contrary, educational institutes are slow in embracing change, both in curricula and in methods of delivery of education. The survival in this knowledge based society, depends upon adaptability. The key to adaptability is continued improvement in education compatible to that of the technology, and institutions have to continuously prove their image on a continual basis.

Engineering Education in India is driven towards commercialization leading to mushrooming of colleges, and stiff competition. However, in most of the cases the direction, relevance, and quality of engineering education have been questioned. Engineering colleges affiliated to universities have to work with many uncontrollable parameters like quality of input, and engineering curriculum. Also, external threats from suppliers like NIIT, APTECH, ISCT, etc., who have a professional outlook and customer orientation, add to the industry pool especially in the information technology area. Considering the dynamic external environment, rigid working system, stiff competition, decline of funds, reduction in the intake seats not being filled, and demand for accountability from stakeholders and customers, perspective of quality has crept in, and the need for a quality system is felt.

Taking the cue of a decade of TQM implementation in educational institutions elsewhere, their success and their problems encountered by them, it is required to assess the need, portability and means for institutionalizing TQM in Engineering Education in India. There is a lack of a well-defined focus and an appropriate roadmap for institutionalization of TQM process.

The thesis aims to assess and address the need for quality perspective in Engineering Education in India. It identifies the factors that aided in TQM institutionalization in industry and relates them to academia for easier portability.

Total Engineering Education Quality Management (TEEQM), a methodology to adapt and institutionalize TQM in education is evolved. It presents a comprehensive methodology for implementation of TQM in three stages namely pre-strategic analysis, strategic analysis and post-strategic analysis:

- Pre-strategic analysis commences with the gap analysis and ends up in formulating a strategic plan.
- Strategic analysis aims at developing future scenario's with alternative strategies and
- Post-strategic analysis develops an operational micro-level framework for assessment of TMC and implementation and evaluation of Continuous improvement, Customer satisfaction and employee participation.

The unique aspects of the thesis include development of modus operandi for making the institutionalization of the TQM/CI process. The operational framework for the implementation of TQM in the system is arrived at, by the development of constructs at different levels, to set up the TQM/Continuous Improvement. A System dynamics model is developed and various scenarios of an organization for different policy plans are discussed. The scenarios with different policy plans, and the constructs developed, will aid in systematizing and standardizing the framework for TQM implementation. The framework developed is made as generic as possible. Various indicators and constructs are designed to enable the institution to self-assess the status of quality and/ or their program.

The methodologies adopted were, extensive literature survey and content analysis, personal interviews, Delphi study assessing the scope of TQM application in India, Structured questionnaire to perceive the preparedness for TQM implementation, Ishikawa method to develop cause-effect relations, and System Dynamics method for scenario generation. Developing constructs, that facilitate institutionalization of the TQM process through standardized procedures in important areas like Top Management Commitment, Continuous Improvement, Self improvement, Total employee and student participation, etc.

Various important results include i) Strategic plan for effective implementation of TQM, detailing the activities at Strategic level, Tactical level, and Operational level. ii) Gap analysis to assess the environment in the organization. iii) Development of a system dynamics model and undertaking dynamic analysis using a simulation package called “STELLA”. iv) Development of constructs for various tenets of TQM. v) Various scenarios’ of the institution, with the different operational constructs.

Key words: Total Quality Management, Continuous Improvement, Top management commitment, Self-improvement, Engineering Education, Factor analysis, TEEQM, Learning Organization, System Dynamics, Strategic Plan, Growth scenarios, Policy plans, Constructs.

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CERTIFICATE

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CHAPTER – I

INTRODUCTION

Globalisation of economies has exposed the industries to a world of formidable market competitors with inconceivable new standards of designs, production cycles, and quality. This relentless competition has resulted in rapid growth, both in speed and breadth of technology at an unprecedented rate, almost on an exponential scale. In this revolutionary world of scientific explosions, technology along with quality has become one of the most important factors to gain the competitive advantage.

There was also a shift from Producers market to Consumers market. Consumers are both quality and cost conscious, and their tastes are changing very frequently. Industries need to adapt to the demands of customers with shorter deadlines to meet their requirements. Industries are thus severely constrained by budgetary and time factors. Only those industries that can cope with this pressure have a competitive edge in the market.

Hence, in this 21st century, workplace environment is changing rapidly, and technical competences as well as other potentials are constantly being redefined. Education needs to cope up with the changing requirements to generate productive manpower capable of meeting the challenges of these demanding times. Future of a technological society is shaped by the actions of engineers. A study by the Organization for Economic Cooperation and Development (OECD) concluded by that, by the year 2000, workers will have to change their jobs situations every eight years [Bauer,1992]. And Tribus(undated) emphasized that, the theme for coming generations of engineering educators ought to be “continuous education for continuous adaptability”.

The survival in this competitive society depends upon adaptability. The key to adaptability is continued improvement in education compatible to that of the technology. The demands of a changing society are creating bigger challenges for institutions of engineering education than ever before, while also making them face severe problems. They are expected to raise the level of knowledge of both the individuals and societies. Therefore an institution needs to engage in an active, on-